भारतीय मानक **IS 11627 : 2023**

Indian Standard

स्कॉट आयतनमापी द्वारा धातु पाउडर का स्पष्ट घनत्व का निर्धारण — पद्धति

(पहला पुनरीक्षण)

Determination of Apparent Density of Metallic Powders by Scott Volumeter — Method

(First Revision)

ICS 77.160

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Powder Metallurgical Materials and Products Sectional Committee, MTD 25

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Powder Metallurgical Material and Product Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1986. This revision has been brought out to bring the standard in the latest style and format of the Indian Standards.

With the growth of powder metallurgical industry, an increasing need has been felt to bring out standards on the methods of tests for various characteristics of metallic powder in order to obtain satisfactory and comparable results. This standard is one of the series on this subject. It is hoped that the formulation of this standard will be of considerable use to the industry.

In the preparation of this standard, assistance has been derived from ISO 3923-2 : 1981 Metallic powders — Determination of apparent density — Part 2: Scott volumeter method.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

Indian Standard

DETERMINATION OF APPARENT DENSITY OF METALLIC POWDERS BY SCOTT VOLUMETER — METHOD

(First Revision)

1 SCOPE

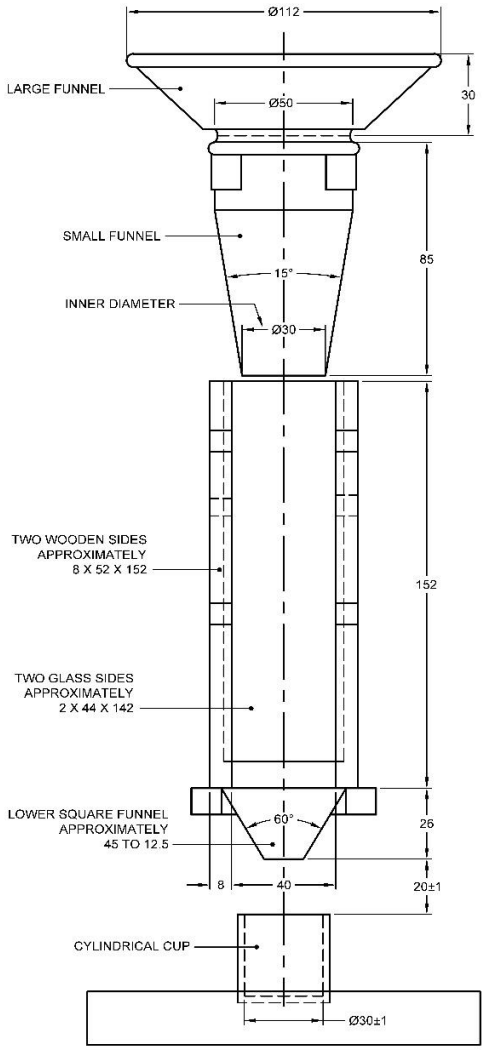
This standard specifies the Scott volumeter method for the determination of the apparent density of metallic powders. It is applicable to powders that will not flow freely through a 5 mm orifice.

2 PRINCIPLE

2.1 Measurement of the mass of a certain quantity of powder which in a loose condition exactly fills a cup of known volume.

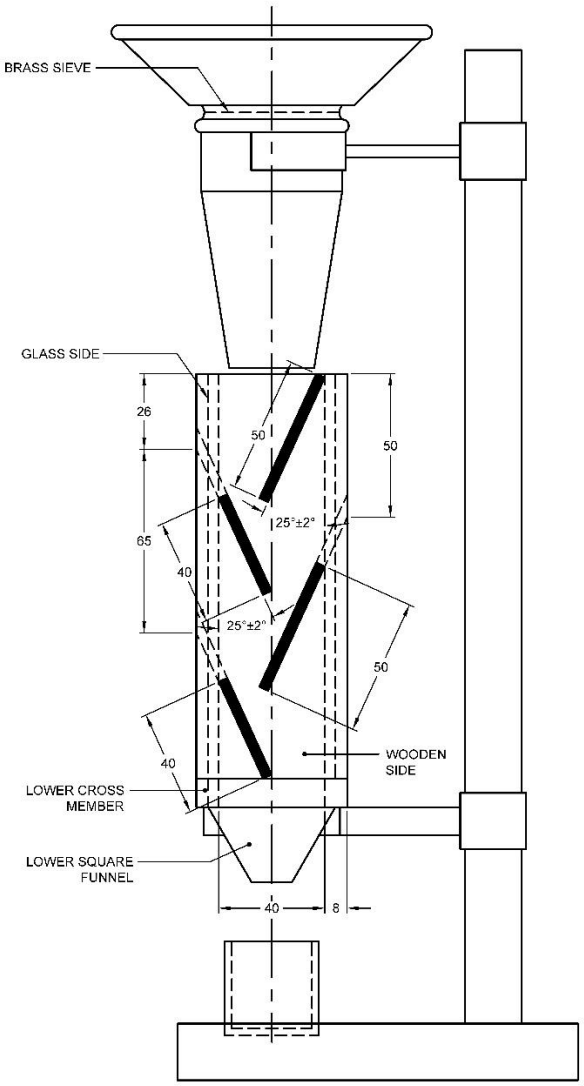
2.2 The loose condition is obtained, when filling the cup, by cascading the powder over a series of inclined plates in a Scott volumeter (*see* Fig. 1 and Fig. 2).

2.3 The ratio between the mass and the volume represents the apparent density.



All dimensions in millimetre.

FIG. 1 TEST APPARATUS – FRONT VIEW



All dimensions in millimetre.

FIG. 2 TEST APPARATUS – SIDE VIEW

3 SYMBOLS AND DESIGNATION

The description of the various symbols used in this standard are given below:

Sl No.	*Symbol*	*Designation*	*Unit*
(1)	(2)	(3)	(4)
i)	ρ_a	Apparent density of metallic powders (general term)	g/cm^3
ii)	ρ_{as}	Apparent density obtained by the Scott volumeter method	g/cm^3
iii)	*m*	Mass of the powder	g
iv)	*V*	Volume of the cup	cm^3

4 APPARATUS

4.1 Scott Volumeter

It comprises the parts given in **4.1.1** to **4.1.3**.

4.1.1 *Funnel*

Having a large and a small conical section separated by a cylindrical section and incorporating a brass sieve of aperture size 1.18 mm (16 mesh).

4.1.2 *Baffle Box*

Having a square section, and containing four glass baffles which may be located and retained by grooves in opposite sides of the box and may thus be removed for ease of cleaning. The baffles are arranged so that the powder falls on each of them in turn, thereby breaking the fall and reducing the velocity of the stream of powder. It is important that none of the powder can pass between the upper edge of the glass baffles and the sides of the baffle box. It is also important that the lower edges of the glass baffles are either in line or slightly overlap in a vertical plane.

A typical design of Scott volumeter is shown in Fig. 1 and Fig. 2. Dimensions given with tolerances are mandatory. The other dimensions represent those most frequently used and may vary slightly, provided that the principal requirement previously mentioned are maintained.

4.1.3 *Stand and Horizontal Vibration-Free Base*

Stand and horizontal vibration free base to support the cup, box and funnel co-axially at the heights indicated in Fig. 1 and Fig. 2.

4.2 Cylindrical Cup

Cylindrical cup having a capacity of 25 cm^3 ± 0.05 cm^3 and an internal diameter of 30 mm ± 1 mm.

NOTE — The cup and funnels should be made of non-magnetic, corrosion-resistant metallic material having sufficient wall thickness and hardness to avoid distortion and excessive wear. The inner surfaces of the cup and funnels should be polished.

4.3 Balance

Balance of sufficient capacity, permitting weighing to an accuracy of ± 0.05 g.

5 SAMPLING

5.1 The test sample shall be of at least 100 cm^3 volume to allow the determination to be carried out on three test portions.

5.2 In general the powder should be tested in the as-received condition. In certain instances, the powder may be dried. However, if the powder is susceptible to oxidation, the drying shall take place in vacuum or in inert gas. If the powder contains volatile substances, it shall not be dried.

6 PROCEDURE

6.1 Pour or feed the powder carefully by means of a spatula into the funnel until the cup is completely filled and powder flows over.

6.2 If the powder is not free flowing, its passage through the sieve may be aided by light brushing with a soft brush.

NOTE — If light brushing is not sufficient to make the powder flow through the sieve, the Scott volumeter method is not applicable to this powder.

6.3 Level the powder with a straight-edge, taking care not to compress or pull-out powder and not to disturb or vibrate the cup.

6.4 After levelling the powder, tap the cup to settle the powder in order to avoid spilling it during transport. Particles on the exterior of the cup. Make sure that there are no adhering particles on the exterior of the cup.

6.5 Determine the mass of the powder to the nearest 0.05 g.

6.6 Repeat the process given in **6.1** to **6.5** and carry out the determinations on three test portions.

7 EXPRESSION OF RESULT

7.1 The apparent density is given by the formula:

$$\rho_{as} = \frac{m}{V} = \frac{m}{25}$$

7.2 Report the arithmetical mean of three determinations to the nearest 0.01 g/cm^3; and also report the highest and the lowest results, if the scatter between results exceeds 1 percent of the mean.

8 TEST REPORT

The test report shall include the following information:

a) Reference to this standard IS 11627;

b) All details necessary for the identification of the test sample;

c) The drying procedure, if the powder has been dried;

d) The result obtained; and

e) Details of any occurrence which may have affected the result.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Powder Metallurgical Materials and Products Sectional Committee, MTD 25

Organization	*Representative(s)*
Indian Institute of Technology Kanpur, Kanpur	DR ANISH UPADHYAY **(*Chairperson*)**
Bhabha Atomic Research Centre, Mumbai	PROF AMIT SINHA
Bharat Heavy Electrical Limited, New Delhi	SHRI VIVEK ARYA SHRI BHARAT KUMAR PANT (*Alternate*)
Controllerate of Quality Assurance, Ichapur	SHRI A. MITRA SHRI T. K. PRUSTY (*Alternate*)
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CSIR − National Metallurgical Laboratory, Jamshedpur	DR V. C. SRIVASTAVA
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The Metal Powder Company Limited, Madhurai	SHRI P. SUNDARAPANDIAN
BIS Directorate General	SHRI SANJIV MAINI, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (METALLURGICAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI G. RAM SAI KUMAR
SCIENTIST 'B'/ASSISTANT DIRECTOR
(METALLURGICAL ENGINEERING), BIS

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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